

Food Science and Technology 761 – Winter 2004 Carbohydrate and Lipid Metabolism

MWF – 10AM –11:18 Parker Food Science 118

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Office Hours: Generally available; however, please call to make sure we are in our offices before stopping by.

Prerequisites: Biochemistry 511 or equivalent and Human Nutrition 310 or Animal Sciences 330 or permission of instructor

Format: Two lectures (78 minute) and one discussion (78 minute) per week

Credit: 5 Hours

Required Text: Biochemical and Physiological Aspects of Human Nutrition- Martha H. Stipanuk.

Recommended Text: Any biochemistry text; Harper's Biochemistry is recommended.

Course Objectives:

1. Digestion, absorption and integrated metabolism of dietary lipids and carbohydrates
2. Specific hormonal and nutritional regulation of lipid and carbohydrate metabolism
3. Influence of dietary carbohydrates and lipids on disease states
4. Comparative metabolism of carbohydrates and lipids in humans and other species

Grading

Exam 1 – 100 points

Exam 2 – 100 points

Final Exam – 150 points

Quizzes/Discussion – 150 points (drop lowest 10-point assignment)

Total Points = 500

Grades

A	500-469	(100-93.8%)	C	382-366	(76.4-73.2%)
A -	468-450	(93.6- 90%)	C-	365-350	(73-70%)
B+	449-434	(89.8-86.8%)	D+	349-334	(69.8-66.8%)
B	433-416	(86.6-83.25%)	D	333-300	(66.6- 60%)
B-	415-400	(83-80%)	E	Below 300	
C+	399-383	(79.8-76.6%)			

Important Dates for Exams/Assignments and Guest Lectures

Jan 9 – Problem Set due – 15 pts	Feb 13 – Rough draft for paper summary (10pts)
Jan 16 – Quiz #1 – 10 pts	Feb 20 – Quiz (20 pts)
– Rewrite of Prob Set due – 10 pts	Feb 23 – Rough draft revisions due (30pts)
Jan 24 – Quiz #2 – 10 pts	Mar 1- Midterm Exam #2 (100 pts)
Jan 31 – 3 rd week reading writeup – 15 pt	Mar 12 – Reading review due (20 pts)
Feb 3- Guest Speaker, return writeups	Final Exam (150pts)
Feb 5 – Guest Speaker	
– 2 nd draft of write up due – 10 pts	
Feb 7 – Midterm Exam #1 –100 pts	
Feb 10 – Abstract Due – 10 pts	

Date	Topic
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Carbohydrates

Jan 5	Course overview / enzyme kinetics and properties / take-home problem set on kinetics / start reading papers for discussion; see website for week 1 reading assignments (JF)
Jan 7	Overview of digestion and metabolism of carbohydrates (JF)
Jan 9	Discuss paper and metabolic consequences of loss of transporters / Problem set due
Jan 12	Glycolysis / gluconeogenesis / Cori cycle / start reading papers for discussion; see website for week 2 reading assignments (JF)
Jan 14	Anaerobic fermentation / dietary fiber (JF)
Jan 16	Discuss paper and need for dietary fiber / quiz / 2nd draft of problem set due
Jan 19	No Class / see website for week 3 reading assignments (JF)
Jan 21	Glycogenesis / glycogenolysis (JF)

- Jan 23 Discuss papers and glycogen loading / **writeup of wk 3 reading assignment due**
- Jan 26 Mitochondrial function / Krebs cycle / electron transport / **see website for week 4 reading assignments (JF)**
- Jan 28 Generation of reducing equivalents for biosynthesis reactions / pentose phosphate pathway / lactose synthesis / lactation (JF)
- Jan 30 Discuss papers / **quiz**
- Feb 2 Guest speaker: Dr. Bryan Wolf. Fructose, fiber, and glycemic index / **2nd draft of writeup from week 3's reading assignment due**
- Feb 4 Guest speaker: Dr. Chris Reynolds. Comparative carbohydrate metabolism in the liver / techniques to study liver metabolism *in vivo*. Write abstract of one of two speakers' guest lectures - **due Feb 10**
- Feb 6 **Midterm exam #1**

Lipids

- Feb 9 (M) Lipids Structure/Function/Digestion/Absorption
Start reading paper #1, see website for reading assignments
#1 Suppression of fatty acid synthase promoter by polyunsaturated fatty acids (2002) Moon et al., J. Lipid Res. 43, 691-698

Read support paper #1 – see website
- Feb 11 (W) Fatty acid synthesis and TG synthesis/storage and mobilization
- Feb 13 (F) Discuss reading assignment
Turn in rough draft of reading review (**10 points**)

Read support paper #2 – see website
- Feb 16 (M) Lipoprotein Synthesis Transport and Metabolism
Start reading paper #2, see website for assignment
#2 Continuous fatty acid oxidation and reduced fat storage in mice lacking acetyl-CoA carboxylase 2 (2001) Science 291:2613-2616.
- Feb 18 (W) Beta-oxidation
- Feb 20 (F) Discuss paper # 2
Quiz (**20 pts**)
Read support paper #3 – Handout in class - McGarry

Feb 23 (M) **Diabetes – Dr. Neile Edens Ross Labs**
Hand in rough draft revisions (**30 points**)

Feb 25 (W) Cholesterol metabolism/Ketogenesis

Feb 27 (F) Exam review

Mar 1 (M) **Midterm Exam # 2 (100 points)**

Start reading paper #3, see website for assignments

#3 An antidiabetic thiazolidinedione is a high affinity ligand for peroxisome proliferator-activated receptor γ (PPAR γ) Lehman et al. (1995) JBC 270(22):12953-12956

Mar 3 (W) Integrated and Comparative Energy Metabolism

Mar 5 (F) Discuss paper #3

Mar 8 (M) Essential Fatty Acids, Lipid Signaling, Prostaglandins, Eicosanoids.

Start reading paper #4, see website for assignment

#4 Differential effects of prostaglandin derived from w-6 and w-3 polyunsaturated fatty acids on COX-2 expression and IL-6 secretion (2003) 100(4):1751-1756.

Mar 10 (W) Conjugated linoleic acid – **Dr. Martha Belury, Associate Professor, Department of Human Nutrition, The Ohio State University**

Mar 12 (F) Discuss paper # 4, Reading review for paper #4 due (**20 points**)

Final Exam – **150 points**

Academic misconduct

"Academic misconduct is defined as any activity which tends to compromise the academic integrity of the institution, subvert the education process. Examples of academic misconduct include:

- 1) violation of course rules as contained in the course syllabus or other information provided the student;
- 2) providing or receiving information during exams and quizzes; or providing or using unauthorized assistance in the laboratory, at the computer terminal, on field work;
- 3) plagiarism, including the use of term papers or laboratory reports from any source other than the student's own work;
- 4) serving as, or enlisting the assistance of, a "ringer" or substitute for a student in the taking of examinations;
- 5) alteration of grades or marks by the student in an effort to change the earned grade or credit;
- 6) alteration of University forms used to drop or add courses to a program, or unauthorized use of those forms; and
- 7) failure to report incidents of academic misconduct."

All cases of suspected misconduct will be reported to the Committee on Academic Misconduct (Office of the Provost, 203 Bricker Hall, 422-5881). Sanctions imposed in cases of established misconduct range from warnings to suspension or dismissal from the University.